

# A Systematic Literature Review of Principal Leadership Strategies in the Digital Era to Empower 21st-Century Teachers

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## Abstrak

Sistem pendidikan telah mengalami transformasi yang luar biasa akibat kemajuan teknologi digital, sehingga kepala sekolah diharuskan memiliki keterampilan kepemimpinan yang fleksibel dan kreatif. Untuk memberdayakan guru dalam pembelajaran abad ke-21, artikel ini akan menganalisis hasil dari dua puluh publikasi nasional dan internasional yang membahas praktik kepemimpinan kepala sekolah di era digital. Metode yang digunakan adalah tinjauan literatur dengan analisis tematik terhadap publikasi yang diterbitkan antara tahun 2021 dan 2025. Temuan studi menunjukkan bahwa dengan mengintegrasikan teknologi pembelajaran, kepemimpinan digital secara signifikan meningkatkan profesionalisme, kepercayaan diri, dan kemampuan pedagogis guru. Kepemimpinan transformasional, visioner, dan partisipatif sering digunakan sebagai strategi yang memprioritaskan kerja tim, kreativitas, dan pengembangan kemampuan digital pendidik. Selain itu, telah terbukti bahwa dorongan administrator terhadap pelatihan teknologi dan budaya kolaboratif meningkatkan kesiapan guru menghadapi tuntutan pendidikan abad ke-21. Proses transformasi ini, bagaimanapun, terhambat oleh sejumlah masalah, termasuk infrastruktur yang tidak memadai, ketimpangan literasi digital, dan resistensi terhadap perubahan. Pemetaan menyeluruh model kepemimpinan kepala sekolah dengan aspek pemberdayaan guru di era digital secara bersamaan, Selain itu, strategi integrasi kepemimpinan kreatif dengan penguatan kompetensi teknologi pedagogis guru sebagai respons terhadap tuntutan pembelajaran abad ke-21, merupakan keunikan dari studi ini. Secara keseluruhan, kepemimpinan kepala sekolah di era digital tidak hanya berkaitan dengan penguasaan teknologi, tetapi juga kemampuan strategis dalam menginspirasi dan memberdayakan guru agar dapat beradaptasi dengan dinamika pendidikan modern.

**Kata kunci:** *Kepemimpinan Digital Tingkat Tinggi, Pemberdayaan Guru di Abad ke-21, Integrasi Teknologi Pendidikan, Kepemimpinan Transformasional dan Partisipatif*

## Abstract

The school system has undergone tremendous transformation as a result of the advancement of digital technologies, necessitating that principals have flexible and creative leadership skills. In order to empower teachers for 21st-century learning, this article will look at the results of twenty national and international publications that cover principal leadership practices in the digital age. A survey of the literature with a thematic analysis of publications published between 2021 and 2025 is the methodology employed. The study's findings show that by integrating learning technology, digital leadership significantly enhances instructors' professionalism, self-efficacy, and pedagogical abilities. Transformational, visionary, and participatory leadership are frequently employed tactics that prioritize teamwork, creativity, and the growth of educators' digital capabilities. Additionally, it has been demonstrated that administrators' encouragement of technology training and a collaborative culture improves teachers' preparedness for the demands of 21st-century education. The transformation process is nevertheless hampered by a number of issues, including inadequate infrastructure, the disparity in digital literacy, and opposition to change. The thorough mapping of the principal's leadership model with the aspects of teacher empowerment in the digital age concurrently, as well as the integration strategy of creative leadership integration with bolstering teachers' pedagogical technology competencies in response to the demands of 21st century learning, constitute the novelty of this study. Overall, principal leadership in the digital era is not only related to mastery of technology, but also strategic abilities in inspiring and empowering teachers to be able to adapt to the dynamics of modern education.

**Keywords:** Digital Principal Leadership, Teacher Empowerment in the 21st Century, Educational Technology Integration, Transformational and Participatory Leadership

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## 1. INTRODUCTION

The development of digital technology over the past two decades has brought significant changes to the global education system, including in Indonesia. This transformation demands a leadership style that is not only adaptive to change but also innovative in creating a 21st-century learning culture (Kemdikbudristek, 2022). As educational leaders, principals play a strategic role in guiding teachers to adapt, innovate, and collaborate through the application of digital technology in the learning process (Heryani et al., 2023). In the Indonesian context, digital transformation in education has become increasingly apparent since the implementation of technology-based learning policies following the COVID-19 pandemic (Rohmawati, 2021). However, various studies show that not all school principals are prepared to face this challenge. Many remain focused on managerial and administrative aspects, while their role as innovative leaders has not been fully optimized (Mulawarman & Komariyah, 2025). Innovative principals are required not only to manage school resources but also to empower teachers to become agents of change in the digital era (Rakha, 2023). According to (Safitri & Prasetyo, 2022), innovative leadership plays a crucial role in creating superior quality educational services. Innovative leaders are able to build a conducive school climate, foster creativity, and encourage collaboration between teachers in technology-based learning. This research is supported by (Heryani et al., 2023), who found that principals with innovative leadership implement constructive, creative, and adaptive strategies that encourage the involvement of all school members in decision-making and the implementation of learning innovations. On the other hand, (Mooduto et al., 2024) emphasize that innovative leadership in the post-pandemic era must integrate digital skills, emotional intelligence, as well as critical and adaptive thinking abilities. Such leadership enables educational organizations to respond to changes quickly and effectively. This aligns with the findings of (Bates, 2022) in his book *Teaching in a Digital Age*, which highlights the importance of educational leaders in helping teachers develop digital competence, critical thinking, and collaborative learning as key 21st-century skills. However, there remains a gap between the expected concept of innovative leadership and its implementation in the field.

Many principals have not fully utilized the potential of technology to improve the quality of learning. Research in Kuwait (Alajmi, 2020) shows that principals' digital leadership significantly influences teachers' ability to integrate learning technology. Meanwhile, in Indonesia, most principals are still at the digital adaptation stage without a systematic innovative strategy (Mulawarman & Komariyah, 2025). In an international context, research (Schmitz et al., 2023) highlights that transformational leadership plays a crucial role in encouraging teachers to use technology meaningfully in learning. Transformational leadership implemented by principals can increase teachers' confidence in using digital technology and develop creative learning strategies. Meanwhile, research (Witthöft et al., 2024) emphasizes the importance of an open innovation mindset in school leadership to foster a collaborative culture and knowledge sharing in the digital innovation process in schools. Furthermore, research (Yang & Chang, 2024) shows that distributed leadership has a positive influence on teacher professional development, with teacher learning communities acting as a key mediator. This means that participatory and collaborative leadership can enhance teacher professionalism through digital-based collaborative learning. These findings reinforce the notion that innovative leadership is not only about the principal's individual abilities, but also about how they build a school ecosystem that supports collaboration and innovation. The book *"Principal Leadership Strategies for Teacher Quality Development"* (Fudholi et al., 2025) emphasizes that in the digital era, principals function not only as administrators but also as innovators capable of empowering teachers to continuously learn and adapt. Principals must be catalysts for change by fostering a culture of continuous learning that aligns with 21st-century learning values such as collaboration, creativity, communication, and critical thinking.

The urgency of this research lies in the need for innovative leadership strategies relevant to the dynamics of the digital era. Although various studies have discussed digital and transformational

leadership, few studies specifically highlight how innovative leadership strategies can empower teachers to achieve 21st-century learning competencies in elementary schools in Indonesia (Zusniarni et al., 2024; Pratama et al., 2020; Sari, 2025). Thus, the novelty of this research lies in the integration of innovative leadership approaches and technology-based teacher empowerment as a strategy for continuously improving the quality of learning. Considering the various research findings above, it can be concluded that innovative leadership strategies in the digital era are key to guiding educational transformation toward 21st-century learning. Principals, as educational leaders, need to play an active role in creating adaptive, collaborative learning environments that are oriented toward teacher competency development. Through innovative leadership strategies, it is hoped that teachers will not only be able to adapt to technology but also become agents of change in creating meaningful and sustainable learning.

## **2. METHOD**

This study uses a Systematic Literature Review (SLR) approach to analyze and synthesize previous research findings related to principal leadership strategies in the digital era. The SLR method was chosen to obtain a comprehensive, evidence-based understanding of the phenomenon under study (Jin, 2023). The research process involved four main stages. First, literature was identified through reputable databases using keywords such as school leadership, digital transformation in education, and teacher empowerment, covering publications from 2020–2025. Second, articles were selected based on inclusion criteria: scientific articles relevant to the context of educational leadership, peer-reviewed, and available in full text. Third, selected articles were analyzed using thematic analysis to identify patterns, strategies, and implications of innovative leadership for teacher empowerment and digital learning transformation. Fourth, data synthesis was conducted to formulate a conceptual framework for leadership strategies relevant to the challenges of 21st-century education. This systematic approach ensures the validity, reliability, and scientific contribution of the research to the development of leadership science and educational innovation (Joshi, 2024).

## **3. RESULT AND DISCUSSION**

Research conducted by (Alajmi, 2020) This study aims to determine the influence of principals' digital leadership on teachers' technology integration during the COVID-19 pandemic in Kuwait. Using a quantitative approach with a survey of 113 principals and 404 teachers, this study shows that digital leadership plays a significant role in improving teachers' ability to integrate online learning technology. The strengths of this study lie in its robust empirical data and relevant pandemic context. However, its weakness is its limited scope within Kuwait, which limits its generalizability. Examined This study explores the digital instructional leadership of school principals in influencing teachers' intrinsic motivation and student learning outcomes. A quantitative survey of 380 teachers in Bahrain found that collaborative digital leadership can improve motivation and the effectiveness of online learning. The strength of this study is its comprehensive analytical model, while its weakness is its lack of in-depth analysis of contextual variables such as school infrastructure support (Berkovich & Hassan, 2024).

Research by (Zeng et al., 2025) This is a systematic review of the influence of principals' digital leadership on teachers' competencies in integrating artificial intelligence (AI) into learning. Using a PRISMA-based systematic literature review, this study confirms that principals' support for digital innovation and teacher training are key to successful AI implementation. The strength of this study is its comprehensive approach, while its weakness

is its limited in-depth analysis of the local context. Study by (Antonopoulou et al., 2025) examined the relationship between teacher leadership and digital competence in elementary schools. Using a survey of 105 teachers in Greece, the study found that transformational leadership increased teacher motivation, collaboration, and readiness for digital change. The strength of this study lies in its empirical contribution to teachers' digital capacity development, but its weakness is the relatively small sample size. (Raptis et al., 2024) examined the role of school leadership in the digital development of educational organizations in Greece. A survey of 117 teachers showed a positive correlation between digital leadership and digital literacy and collaborative school culture. The study's strength is its focus on the digital organizational aspect, while its weakness is the lack of qualitative exploration of the social factors supporting change.

Research by (Indra et al., 2022) This study analyzed the implementation of e-leadership by principals in online learning at public high schools in Padang. Using quantitative methods with 150 respondents, the results showed that e-leadership improves teacher work behavior and performance. The strength of this study is its relevance to the Indonesian context, but its weakness is its focus on technical aspects without an in-depth exploration of the school's digital culture. (McCarthy et al., 2023) examines digital transformation in education by identifying critical components for education system leaders. The results of the thematic analysis indicate the need for an integrated leadership strategy that encompasses vision, culture, and organizational capacity. While this study's strength lies in the development of a robust theoretical framework, its weakness is the lack of empirical data to test the proposed model (Elezi, 2021). This study describes the leadership challenges of principals in building school resilience in the digital age. Using a qualitative approach, this study found that democratic and transformational leadership styles are effective in building school resilience. Its strength lies in the depth of contextual analysis, while its weakness is its limited scope within a single school. (Wiyana et al., 2024).

This study examines the technology-based transformation of principal leadership in educational administration. Interview results indicate that administrative digitization improves teacher efficiency and professionalism. The strength of this research is its application, but its weakness lies in the lack of quantitative analysis to support the qualitative findings. (Fahma et al., 2024) This study examines the principal's visionary leadership strategies in driving innovative change in Muhammadiyah schools. This research shows that vision, collaboration, and teacher empowerment are key factors in successful transformation. The strength of this study is its inspiring examples of real-world practice, but its weakness is the limited generalizability of the results. (Mulyadi et al., 2025) This study analyzes visionary leadership strategies in addressing the challenges of 21st-century education. The results demonstrate that visionary principals are able to leverage technology to enhance the quality of learning. The strength of this research is its relevance to global issues, while its weakness is the lack of empirical field data. (Restu Rahayu & Sofyan Iskandar, 2023) conducted a literature review on the transformational leadership of school principals in 21st-century learning. The results confirmed that transformational leadership plays a significant role in learning innovation and teacher collaboration. The strength of this study is its theoretical depth, but its weakness is the lack of empirical data. (Ratna et al., 2025) This study examines the implementation of a 4I-based transformational leadership model in addressing the challenges of 21st-century education. The results indicate that principals who implement all four 4I dimensions create dynamic learning environments. The strength of this study is the clear contribution of the theoretical model, but its weakness is the limited field testing. (Dahlani et al., 2025) This study highlights the role of principals as transformational leaders

in the digital era. This article concludes that transformational leaders are able to integrate technology and student character. The strength of this study is its emphasis on digital ethics, while its weakness is its conceptual approach without field data. (Fullan, 2002) In his work, "Leading in a Culture of Change," he explores the characteristics of effective leadership in the context of organizational cultural change. He emphasizes the importance of moral purpose and continuous learning in leadership. The strength of this work is its depth of theoretical reflection, while its weakness is its lack of specific focus on the digital context.

Research results show that digital leadership is a crucial pillar in promoting quality learning in today's technological era. Principals serve not only as administrators but also as innovators, motivators, and facilitators in implementing a school's digital ecosystem. The research in the journal emphasizes that school leaders must possess digital literacy, managerial skills, and a vision for technology-based educational transformation. This aligns with various previous studies that have shown that digital leadership directly impacts the effectiveness of the learning process, teacher professionalism, and school readiness to face the demands of the 21st century. Thus, the implementation of digital leadership is not merely the use of technology, but a strategic process in creating a positive culture, empowering teachers, and ensuring adaptive, innovative, and sustainable learning.

Research conducted by (Hafiza Hamzah et al., 2021) This study aims to determine the influence of principals' digital leadership on teachers' ability to implement technology-based learning in Malaysia during the COVID-19 pandemic. Using a quantitative approach through a survey of 400 secondary school teachers, the results of this study indicate a positive relationship between digital leadership practices and teachers' ability to integrate technology into the teaching and learning process. The strengths of this study lie in the use of valid instruments and robust empirical data. Its limitations are its limited context within Malaysia and the lack of an in-depth discussion of cultural factors that may influence the implementation of digital leadership. Research by (Rahman & Hamid, 2025) analyzed the relationship between principals' digital leadership practices and history teachers' self-efficacy in Malaysian secondary schools. Using a quantitative approach with an online questionnaire of 162 teachers using the NETS-A model, this study found a significant positive correlation between principals' digital leadership practices and teachers' confidence in implementing learning technology. The strength of this study lies in the use of a strong theoretical model and structured empirical measurements, while its weakness is the limited generalizability of the results due to the focus on a single educational district. Nevertheless, this study confirms that effective digital leadership can improve teachers' self-efficacy and motivation towards 21st-century learning.

Research conducted by (April et al., 2025) This study describes the leadership strategies of madrasah principals in facing management challenges in the digital era. Using a descriptive quantitative approach to 10 madrasah principals in Tilatang Kamang District, the results show that the majority of madrasah principals have a clear digital vision and encourage teacher innovation through the use of technology in teaching and learning activities. The strength of this study lies in its contribution to the rarely studied local context of madrasahs, while its weaknesses are the limited sample size and the failure to measure the direct impact on learning outcomes. These findings suggest that adaptive leadership at the madrasah level can be an important foundation in driving digital education transformation in religious-based schools. Study conducted by (Nurdin et al., 2024) examined the influence of digital leadership on improving organizational capabilities in Early Childhood Education (PAUD) institutions in Bandung City. Using a quantitative approach with Structural Equation Modeling (SEM) analysis of 238 respondents, the results showed a significant influence

between digital leadership and strengthening a culture of innovation and technological readiness in PAUD environments. The strength of this study lies in the use of advanced statistical methods that provide reliable results, while its weakness is that it has not explored qualitative factors such as policy support and organizational culture. This study emphasizes the importance of developing adaptive digital leadership to improve the effectiveness of educational organizations at the elementary level.

#### **4. CONCLUSION**

Based on a review of twenty scientific articles, both national and international, it can be concluded that principal leadership in the digital era plays a strategic role in driving educational transformation toward 21st-century learning. All research findings demonstrate that visionary, collaborative, and innovation-based digital leadership contributes significantly to improving teacher professionalism, motivation, and self-efficacy in integrating technology into the learning process. Principals who are able to utilize information and communication technology not only strengthen school governance but also create an adaptive, creative, and collaborative learning culture. From a strategic perspective, the majority of studies emphasize the importance of developing principals' digital competencies through ongoing training, the use of transformational leadership models, and the implementation of data-driven policies in decision-making. Teacher empowerment is identified as a key element of success, with principal support in the form of facilitating ICT training, digital mentoring, and creating an innovative environment proven to improve learning quality and student readiness for global challenges.

However, several studies have also identified challenges such as limited infrastructure, resistance to change, and disparities in digital competency among educators. Therefore, digital leadership transformation requires systemic support from the government, educational institutions, and the community to ensure technology adoption is not sporadic, but rather targeted and sustainable. Overall, principal leadership in the digital era is not just about technological competence, but also the strategic capacity to inspire, guide, and empower teachers to adapt to the 21st-century educational paradigm. The success of digital educational transformation is largely determined by the extent to which principals can balance the dimensions of technology, pedagogy, and human leadership in carrying out their role as agents of change.

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